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"Proximity-Coupled High- T_c Josephson Junctions: Do They Exist?"

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A significant portion of the worldwide effort to develop high- T_c Josephson junctions for electronic applications has been dedicated to superconductor-normal-superconductor (SNS) junctions. Numerous groups have reported nominally-SNS junctions with a variety of geometries and normal interlayers. Until recently, the electrical properties of these junctions have been interpreted almost exclusively in terms of conventional proximity effect theory, which describes very well the behavior of low- T_c SNS devices. It is now clear, however, that it is only recently that proximity effect theory was successfully applied to any high- T_c SNS device [1],[2], despite vigorous but unsupported prior claims. In fact, almost all high- T_c SNS junctions are far better understood by assuming that transport occurs through unintended pinholes in the normal interlayers [1], an idea that is rapidly gaining in acceptance.

This talk will review high- T_c SNS junction research and its interpretation in the light of both conventional proximity effect theory and experimental data on other types of high- T_c junctions. Emphasis will be placed on recent results from junctions which are well described by proximity effect theory [2] and the implications for future research will be examined. The discussion will also derive broader lessons from what has proven to be yet another research area in which wishful thinking has impeded scientific judgment and, hence, progress.

[1] K.A. Delin and A.W. Kleinsasser, IEEE Trans. Appl. Supercond. 5,2976 (1995).

[2] A.W. Kleinsasser and K.A. Delin, Appl. Phys. Lett. 66, 102 (1995).